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S27	9	S6 and ("uniform distribution")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S5	82	S3 and (entropy near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S32	0	S6 and (re-us\$3 with feature with gain)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S33	0	S6 and (re-us\$3 with feature with gain)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S30	1	S6 and (gain with (predetermined or prespecified))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S31	1	S6 and ("top-ranked" with feature with number)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
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S38	76	S37 and ("maximum entropy" near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S39	82	S37 and (entropy near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S40	93	S38 or S39	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S41	23	S40 and (select\$3 near2 feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB

S42	6	S40 and (gain with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S43	7	S40 and (candidate near2 feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S54	1	S40 and (gain with "upper bound")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S44	6	S40 and ((comput\$3 or determin\$3) with gain)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S45	4	S40 and (rank\$3 with gain)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S46	3	S40 and (rank\$3 with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S47	10	S40 and (order\$3 with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S48	2	S40 and ("top-ranked" with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S49	2	S40 and ("top-ranked" with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S50	3	S40 and (highest near2 gain)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S51	39	S40 and (model\$3 with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S52	17	S40 and (adjust\$3 or modify\$3) with model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S53	3	S40 and (select\$3 with (stage or phase))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S56	6	S40 and ((conditional near2 probabill\$3) with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S58	9	S40 and ("uniform distribution")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S55	1	S40 and (re-comput\$3 with gain)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S59	1	S40 and ("next-ranked" with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S57	1	S40 and (gain with "uniform distribution")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S61	1	S40 and ("top-ranked" with feature with number)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S60	1	S40 and (gain with (predetermined or prespecified))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S62	8	S40 and (reusing or reused)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S63	59	S41 or S42 or S43 or S44 or S45 or S46 or S47 or S48 or S49 or S50 or S51 or S52 or S53 c	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S82	1	S67 and (re-comput\$3 with gain)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S79	17	S67 and ((adjust\$3 or modify\$3) with model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S80	3	S67 and (select\$3 with (stage or phase))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S68	23	S67 and (select\$3 near2 feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S77	3	S67 and (highest near2 gain)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S81	1	S67 and (gain with "upper bound")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S83	6	S67 and ((conditional near2 probabill\$3) with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S84	1	S67 and (gain with "uniform distribution")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S86	1	S67 and ("next-ranked" with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S85	9	S67 and ("uniform distribution")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S88	1	S67 and ("top-ranked" with feature with number)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S89	8	S67 and (reusing or reused)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S87	1	S67 and (gain with (predetermined or prespecified))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S90	59	S68 or S69 or S70 or S71 or S72 or S73 or S74 or S75 or S76 or S77 or S78 or S79 or S80 c	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
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S92	1	S91 and (remov\$3 or eliminat\$3 or discard\$3) with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S74	10	S67 and (order\$3 with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
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S70	7	S67 and (candidate near2 feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S76	2	S67 and ("top-ranked" with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S78	39	S67 and (model\$3 with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S71	6	S67 and ((comput\$3 or determin\$3) with gain)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S67	93	S65 or S66	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S66	82	S64 and (entropy near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S69	6	S67 and (gain with feature)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB
S65	76	S64 and ("maximum entropy" near2 model\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB

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41 [Why nitpicking works: evidence for Occam's Razor in error correctors](#)

Dekai Wu, Grace Ngai, Marine Carpuat

 August 2004 **Proceedings of the 20th international conference on Computational Linguistics COLING '04**

Publisher: Association for Computational Linguistics

 Full text available: pdf(283.34 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

Empirical experience and observations have shown us when powerful and highly tunable classifiers such as maximum entropy classifiers, boosting and SVMs are applied to language processing tasks, it is possible to achieve high accuracies, but eventually their performances all tend to plateau out at around the same point. To further improve performance, various error correction mechanisms have been developed, but in practice, most of them cannot be relied on to predictably improve performance on un ...

42 [Verb phrase ellipsis detection using automatically parsed text](#)

Leif Arda Nielsen

 August 2004 **Proceedings of the 20th international conference on Computational Linguistics COLING '04**

Publisher: Association for Computational Linguistics

 Full text available: pdf(170.05 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

This paper describes a Verb Phrase Ellipsis (VPE) detection system, built for robustness, accuracy and domain independence. The system is corpus-based, and uses a variety of machine learning techniques on free text that has been automatically parsed using two different parsers. Tested on a mixed corpus comprising a range of genres, the system achieves a 72% F1-score. It is designed as the first stage of a complete VPE resolution system that is input free text, detects VPEs, and proceeds to find ...

43 [Linguistically informed statistical models of constituent structure for ordering in sentence realization](#)

Eric Ringger, Michael Gamon, Robert C. Moore, David Rojas, Martine Smets, Simon Corston-Oliver

 August 2004 **Proceedings of the 20th international conference on Computational Linguistics COLING '04**

Publisher: Association for Computational Linguistics

 Full text available: pdf(136.95 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

We present several statistical models of syntactic constituent order for sentence

realization. We compare several models, including simple joint models inspired by existing statistical parsing models, and several novel conditional models. The conditional models leverage a large set of linguistic features without manual feature selection. We apply and evaluate the models in sentence realization for French and German and find that a particular conditional model outperforms all others. We employ a ...

44 High-performance tagging on medical texts

Udo Hahn, Joachim Wermter

August 2004 **Proceedings of the 20th international conference on Computational Linguistics COLING '04**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(96.19 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

We ran both Brill's rule-based tagger and TNT, a statistical tagger, with a default German newspaper-language model on a medical text corpus. Supplied with limited lexicon resources, TNT outperforms the Brill tagger with state-of-the-art performance figures (close to 97% accuracy). We then trained TNT on a large annotated medical text corpus, with a slightly extended tagset that captures certain medical language particularities, and achieved 98% tagging accuracy. Hence, statistical off-the-shelf ...

45 Acquiring the meaning of discourse markers

Ben Hutchinson

July 2004 **Proceedings of the 42nd Annual Meeting on Association for Computational Linguistics ACL '04**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(95.33 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

This paper applies machine learning techniques to acquiring aspects of the meaning of discourse markers. Three subtasks of acquiring the meaning of a discourse marker are considered: learning its **polarity**, **veridicality**, and **type** (i.e. causal, temporal or additive). Accuracy of over 90% is achieved for all three tasks, well above the baselines.

46 Incremental parsing with the perceptron algorithm

Michael Collins, Brian Roark

July 2004 **Proceedings of the 42nd Annual Meeting on Association for Computational Linguistics ACL '04**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(141.53 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

This paper describes an incremental parsing approach where parameters are estimated using a variant of the perceptron algorithm. A beam-search algorithm is used during both training and decoding phases of the method. The perceptron approach was implemented with the same feature set as that of an existing generative model (Roark, 2001a), and experimental results show that it gives competitive performance to the generative model on parsing the Penn treebank. We demonstrate that training a perceptr ...

47 Discriminative language modeling with conditional random fields and the perceptron algorithm

Brian Roark, Murat Saraclar, Michael Collins, Mark Johnson

July 2004 **Proceedings of the 42nd Annual Meeting on Association for Computational Linguistics ACL '04**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(219.59 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

This paper describes discriminative language modeling for a large vocabulary speech recognition task. We contrast two parameter estimation methods: the perceptron algorithm, and a method based on conditional random fields (CRFs). The models are

encoded as deterministic weighted finite state automata, and are applied by intersecting the automata with word-lattices that are the output from a baseline recognizer. The perceptron algorithm has the benefit of automatically selecting a relatively small ...

48 A maximum entropy approach to species distribution modeling



Steven J. Phillips, Miroslav Dudík, Robert E. Schapire

July 2004 **Proceedings of the twenty-first international conference on Machine learning ICML '04**

Publisher: ACM Press

Full text available: pdf(163.78 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

We study the problem of modeling species geographic distributions, a critical problem in conservation biology. We propose the use of maximum-entropy techniques for this problem, specifically, sequential-update algorithms that can handle a very large number of features. We describe experiments comparing maxent with a standard distribution-modeling tool, called GARP, on a dataset containing observation data for North American breeding birds. We also study how well maxent performs as a function of ...

49 Head-Driven Statistical Models for Natural Language Parsing

Michael Collins

December 2003 **Computational Linguistics**, Volume 29 Issue 4

Publisher: MIT Press

Full text available: pdf(633.30 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This article describes three statistical models for natural language parsing. The models extend methods from probabilistic context-free grammars to lexicalized grammars, leading to approaches in which a parse tree is represented as the sequence of decisions corresponding to a head-centered, top-down derivation of the tree. Independence assumptions then lead to parameters that encode the X-bar schema, subcategorization, ordering of complements, placement of adjuncts, bigram lexical dependencies, ...

50 Knowledge management session 2: semantic web: Learning cross-document structural relationships using boosting



Zhu Zhang, Jahna Otterbacher, Dragomir Radev

November 2003 **Proceedings of the twelfth international conference on Information and knowledge management CIKM '03**

Publisher: ACM Press

Full text available: pdf(145.37 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Multi-document discourse analysis has emerged with the potential of improving various information retrieval applications. Based on the newly proposed Cross-document Structure Theory (CST), this paper describes an empirical study that uses boosting to classify CST relationships between sentence pairs extracted from topically related documents. We show that the binary classifier for determining existence of structural relationships significantly outperforms the baseline. We also achieve promising r ...

Keywords: boosting, classification, cross-document structure, discourse analysis

51 Music: Polyphonic music modeling with random fields



Victor Lavrenko, Jeremy Pickens

November 2003 **Proceedings of the eleventh ACM international conference on Multimedia MULTIMEDIA '03**

Publisher: ACM Press

Full text available: pdf(240.18 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index](#)

terms

Recent interest in the area of music information retrieval and related technologies is exploding. However, very few of the existing techniques take advantage of recent developments in statistical modeling. In this paper we discuss an application of Random Fields to the problem of creating accurate yet flexible statistical models of polyphonic music. With such models in hand, the challenges of developing effective searching, browsing and organization techniques for the growing bodies of music col ...

52 Embedding web-based statistical translation models in cross-language information retrieval

Wessel Kraaij, Jian-Yun Nie, Michel Simard


September 2003 **Computational Linguistics**, Volume 29 Issue 3

Publisher: MIT Press

Full text available:  [pdf\(381.29 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Although more and more language pairs are covered by machine translation (MT) services, there are still many pairs that lack translation resources. Cross-language information retrieval (CLIR) is an application that needs translation functionality of a relatively low level of sophistication, since current models for information retrieval (IR) are still based on a bag of words. The Web provides a vast resource for the automatic construction of parallel corpora that can be used to train statistical ...

53 Posters: Music modeling with random fields

 Victor Lavrenko, Jeremy Pickens

July 2003 **Proceedings of the 26th annual international ACM SIGIR conference on Research and development in information retrieval SIGIR '03**

Publisher: ACM Press


Full text available:  [pdf\(98.04 KB\)](#) Additional Information: [full citation](#), [references](#), [index terms](#)

54 A fast algorithm for feature selection in conditional maximum entropy modeling

Yaqian Zhou, Lide Wu, Fuliang Weng, Hauke Schmidt

July 2003 **Proceedings of the 2003 conference on Empirical methods in natural language processing - Volume 10**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(267.62 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

This paper describes a fast algorithm that selects features for conditional maximum entropy modeling. Berger et al. (1996) presents an incremental feature selection (IFS) algorithm, which computes the approximate gains for all candidate features at each selection stage, and is very time-consuming for any problems with large feature spaces. In this new algorithm, instead, we only compute the approximate gains for the top-ranked features based on the models obtained from previous stages. Experiment ...

55 Single character Chinese named entity recognition

Xiaodan Zhu, Mu Li, Jianfeng Gao, Chang-Ning Huang

July 2003 **Proceedings of the second SIGHAN workshop on Chinese language processing - Volume 17**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(176.35 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Single character named entity (SCNE) is a name entity (NE) composed of one Chinese character, such as "[Abstract contained text which could not be captured.]" (*zhong1, China*) and "[Abstract contained text which could not be captured.]" (*e2, Russia*). SCNE is

very common in written Chinese text. However, due to the lack of in-depth research, SCNE is a major source of errors in named entity recognition (NER). This paper formulates the SCNE recognition within the source-channel model f ...

56 Identification of patients with congestive heart failure using a binary classifier: a case study

Serguei V. Pakhomov, James Buntrock, Christopher G. Chute

July 2003 **Proceedings of the ACL 2003 workshop on Natural language processing in biomedicine - Volume 13**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(97.06 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)


This paper addresses a very specific problem that happens to be common in health science research. We present a machine learning based method for identifying patients diagnosed with congestive heart failure and other related conditions by automatically classifying clinical notes. This method relies on a Perceptron neural network classifier trained on comparable amounts of positive and negative samples of clinical notes previously categorized by human experts. The documents are represented as fea ...

57 Closing the gap: learning-based information extraction rivaling knowledge-engineering methods

Hai Leong Chieu, Hwee Tou Ng, Yoong Keok Lee

July 2003 **Proceedings of the 41st Annual Meeting on Association for Computational Linguistics - Volume 1 ACL '03**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(115.36 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)


In this paper, we present a learning approach to the scenario template task of information extraction, where information filling one template could come from multiple sentences. When tested on the MUC-4 task, our learning approach achieves accuracy competitive to the best of the MUC-4 systems, which were all built with manually engineered rules. Our analysis reveals that our use of full parsing and state-of-the-art learning algorithms have contributed to the good performance. To our knowledge, t ...

58 Confidence estimation for translation prediction

Simona Gandrabur, George Foster

May 2003 **Proceedings of the seventh conference on Natural language learning at HLT-NAACL 2003 - Volume 4**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(342.14 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)


The purpose of this work is to investigate the use of machine learning approaches for confidence estimation within a statistical machine translation application. Specifically, we attempt to learn probabilities of correctness for various model predictions, based on the native probabilities (i.e. the probabilities given by the original model) and on features of the current context. Our experiments were conducted using three original translation models and two types of neural nets (single-layer and m ...

59 Inducing history representations for broad coverage statistical parsing

James Henderson

May 2003 **Proceedings of the 2003 Conference of the North American Chapter of the Association for Computational Linguistics on Human Language Technology - Volume 1 NAACL '03**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(129.57 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

We present a neural network method for inducing representations of parse histories and


using these history representations to estimate the probabilities needed by a statistical left-corner parser. The resulting statistical parser achieves performance (89.1% F-measure) on the Penn Treebank which is only 0.6% below the best current parser for this task, despite using a smaller vocabulary size and less prior linguistic knowledge. Crucial to this success is the use of structurally determined soft bi ...

60 In question answering, two heads are better than one

Jennifer Chu-Carroll, Krzysztof Czub, John Prager, Abraham Ittycheriah

May 2003 **Proceedings of the 2003 Conference of the North American Chapter of the Association for Computational Linguistics on Human Language Technology - Volume 1 NAACL '03**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(102.68 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Motivated by the success of ensemble methods in machine learning and other areas of natural language processing, we developed a multi-strategy and multi-source approach to question answering which is based on combining the results from different answering agents searching for answers in multiple corpora. The answering agents adopt fundamentally different strategies, one utilizing primarily knowledge-based mechanisms and the other adopting statistical techniques. We present our multi-level answer ...

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 Relevance scale ☐ ☐ ☐ ☐ ☐

61 [Supervised and unsupervised PCFG adaptation to novel domains](#)

Brian Roark, Michiel Bacchiani

 May 2003 **Proceedings of the 2003 Conference of the North American Chapter of the Association for Computational Linguistics on Human Language Technology - Volume 1 NAACL '03**

Publisher: Association for Computational Linguistics

 Full text available: [pdf\(139.23 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

This paper investigates adapting a lexicalized probabilistic context-free grammar (PCFG) to a novel domain, using maximum *a posteriori* (MAP) estimation. The MAP framework is general enough to include some previous model adaptation approaches, such as corpus mixing in Gildea (2001), for example. Other approaches falling within this framework are more effective. In contrast to the results in Gildea (2001), we show F-measure parsing accuracy gains of as much as 2.5% for high accuracy lexical ...

62 [Challenges in information retrieval and language modeling: report of a workshop held at the center for intelligent information retrieval, University of Massachusetts Amherst, September 2002](#)

James Allan, Jay Aslam, Nicholas Belkin, Chris Buckley, Jamie Callan, Bruce Croft, Sue Dumais, Norbert Fuhr, Donna Harman, David J. Harper, Djoerd Hiemstra, Thomas Hofmann, Eduard Hovy, Wessel Kraaij, John Lafferty, Victor Lavrenko, David Lewis, Liz Liddy, R. Manmatha, Andrew McCallum, Jay Ponte, John Prager, Dragomir Radev, Philip Resnik, Stephen Robertson, Roni Rosenfeld, Salim Roukos, Mark Sanderson, Rich Schwartz, Amit Singhal, Alan Smeaton, Howard Turtle, Ellen Voorhees, Ralph Weischedel, Jinxi Xu, ChengXiang Zhai

 April 2003 **ACM SIGIR Forum**, Volume 37 Issue 1

Publisher: ACM Press

 Full text available: [pdf\(1.60 MB\)](#) Additional Information: [full citation](#), [citations](#), [index terms](#), [review](#)

63 [Special issue on special feature: Sufficient dimensionality reduction](#)

Amir Globerson, Naftali Tishby

 March 2003 **The Journal of Machine Learning Research**, Volume 3

Publisher: MIT Press

 Full text available: [pdf\(266.18 KB\)](#) Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#)


Dimensionality reduction of empirical co-occurrence data is a fundamental problem in unsupervised learning. It is also a well studied problem in statistics known as the analysis of cross-classified data. One principled approach to this problem is to represent the data in low dimension with minimal loss of (mutual) information contained in the original data. In this paper we introduce an information theoretic nonlinear method for finding such a most informative dimension reduction. In contrast wi ...

64 Automatic labeling of semantic roles

Daniel Gildea, Daniel Jurafsky

September 2002 **Computational Linguistics**, Volume 28 Issue 3

Publisher: MIT Press

Full text available:  pdf(573.51 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)


*We present a system for identifying the semantic relationships, or **semantic roles**, filled by constituents of a sentence within a semantic frame. Given an input sentence and a target word and frame, the system labels constituents with either abstract semantic roles, such as AGENT or PATIENT, or more domain-specific semantic roles, such as SPEAKER, MESSAGE, and TOPIC. The system is based on statistical classifiers trained on roughly 50,000 sentences that were h ...*

65 The disambiguation of nominalizations

Maria Lapata

September 2002 **Computational Linguistics**, Volume 28 Issue 3

Publisher: MIT Press

Full text available:  pdf(471.69 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This article addresses the interpretation of nominalizations, a particular class of compound nouns whose head noun is derived from a verb and whose modifier is interpreted as an argument of this verb. Any attempt to automatically interpret nominalizations needs to take into account: (a) the selectional constraints imposed by the nominalized compound head, (b) the fact that the relation of the modifier and the head noun can be ambiguous, and (c) the fact that these constraints can be easily overr ...

66 Combining classifiers for Chinese word segmentation

Nianwen Xue, Susan P. Converse

September 2002 **Proceeding of the first SIGHAN workshop on Chinese language processing - Volume 18**

Publisher: Association for Computational Linguistics

Full text available:  pdf(96.17 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)


In this paper we report results of a supervised machine-learning approach to Chinese word segmentation. First, a maximum entropy tagger is trained on manually annotated data to automatically labels the characters with tags that indicate the position of character within a word. An error-driven transformation-based tagger is then trained to clean up the tagging inconsistencies of the first tagger. The tagged output is then converted into segmented text. The preliminary results show that this appro ...

67 Extracting the unextractable: a case study on verb-particles

Timothy Baldwin, Aline Villavicencio

August 2002 **proceeding of the 6th conference on Natural language learning - Volume 20 COLING-02**

Publisher: Association for Computational Linguistics

Full text available:  pdf(173.70 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

This paper proposes a series of techniques for extracting English verb--particle

constructions from raw text corpora. We initially propose three basic methods, based on tagger output, chunker output and a chunk grammar, respectively, with the chunk grammar method optionally combining with an attachment resolution module to determine the syntactic structure of verb--preposition pairs in ambiguous constructs. We then combine the three methods together into a single classifier, and add in a number ...

68 Combining heterogeneous classifiers for word-sense disambiguation

Dan Klein, Kristina Toutanova, H. Tolga Ilhan, Sepandar D. Kamvar, Christopher D. Manning
July 2002 **Proceedings of the ACL-02 workshop on Word sense disambiguation: recent successes and future directions - Volume 8**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(157.04 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

This paper discusses ensembles of simple but heterogeneous classifiers for word-sense disambiguation, examining the Stanford-CS224N system entered in the SENSEVAL-2 English lexical sample task. First-order classifiers are combined by a second-order classifier, which variously uses majority voting, weighted voting, or a maximum entropy model. While individual first-order classifiers perform comparably to middle-scoring teams' systems, the combination achieves high performance. We discuss trade-of ...

69 Discriminative training methods for hidden Markov models: theory and experiments with perceptron algorithms

Michael Collins

July 2002 **Proceedings of the ACL-02 conference on Empirical methods in natural language processing - Volume 10 EMNLP '02**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(295.08 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)


We describe new algorithms for training tagging models, as an alternative to maximum-entropy models or conditional random fields (CRFs). The algorithms rely on Viterbi decoding of training examples, combined with simple additive updates. We describe theory justifying the algorithms through a modification of the proof of convergence of the perceptron algorithm for classification problems. We give experimental results on part-of-speech tagging and base noun phrase chunking, in both cases showing i ...

70 A hybrid approach to natural language web search

Jennifer Chu-Carroll, John Prager, Yael Ravin, Christian Cesar

July 2002 **Proceedings of the ACL-02 conference on Empirical methods in natural language processing - Volume 10 EMNLP '02**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(118.21 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

We describe a hybrid approach to improving search performance by providing a natural language front end to a traditional keyword-based search engine. The key component of the system is iterative query formulation and retrieval, in which one or more queries are automatically formulated from the user's question, issued to the search engine, and the results accumulated to form the hit list. New queries are generated by relaxing previously-issued queries using transformation rules, applied in an ord ...


71 Machine learning in automated text categorization



Fabrizio Sebastiani

March 2002 **ACM Computing Surveys (CSUR)**, Volume 34 Issue 1

Publisher: ACM Press

Full text available:  [pdf\(524.41 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The automated categorization (or classification) of texts into predefined categories has

witnessed a booming interest in the last 10 years, due to the increased availability of documents in digital form and the ensuing need to organize them. In the research community the dominant approach to this problem is based on machine learning techniques: a general inductive process automatically builds a classifier by learning, from a set of preclassified documents, the characteristics of the categories. ...

Keywords: Machine learning, text categorization, text classification

72 Automatic verb classification based on statistical distributions of argument structure

Paola Merlo, Suzanne Stevenson

September 2001 **Computational Linguistics**, Volume 27 Issue 3

Publisher: MIT Press

Full text available:  pdf(341.42 KB)



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Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Automatic acquisition of lexical knowledge is critical to a wide range of natural language processing tasks. Especially important is knowledge about verbs, which are the primary source of relational information in a sentence---the predicate-argument structure that relates an action or state to its participants (i.e., who did what to whom). In this work, we report on supervised learning experiments to automatically classify three major types of English verbs, based on their argument structure--sp ...

73 XML-based data preparation for robust deep parsing

Claire Grover, Alex Lascarides

July 2001 **Proceedings of the 39th Annual Meeting on Association for Computational Linguistics ACL '01**

Publisher: Association for Computational Linguistics

Full text available:  pdf(87.15 KB)



Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

We describe the use of XML tokenisation, tagging and mark-up tools to prepare a corpus for parsing. Our techniques are generally applicable but here we focus on parsing Medline abstracts with the ANLT wide-coverage grammar. Hand-crafted grammars inevitably lack coverage but many coverage failures are due to inadequacies of their lexicons. We describe a method of gaining a degree of robustness by interfacing POS tag information with the existing lexicon. We also show that XML tools provide a soph ...

74 What is the minimal set of fragments that achieves maximal parse accuracy?

Rens Bod

July 2001 **Proceedings of the 39th Annual Meeting on Association for Computational Linguistics ACL '01**

Publisher: Association for Computational Linguistics

Full text available:  pdf(69.87 KB)



Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

We aim at finding the minimal set of fragments which achieves maximal parse accuracy in Data Oriented Parsing. Experiments with the Penn Wall Street Journal treebank show that counts of almost arbitrary fragments within parse trees are important, leading to improved parse accuracy over previous models tested on this treebank (a precision of 90.8% and a recall of 90.6%). We isolate some dependency relations which previous models neglect but which contribute to higher parse accuracy.

75 Beyond standard CFG parsing: New ranking algorithms for parsing and tagging: kernels over discrete structures, and the voted perceptron

Michael Collins, Nigel Duffy

July 2001 **Proceedings of the 40th Annual Meeting on Association for Computational Linguistics ACL '02**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(137.02 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

This paper introduces new learning algorithms for natural language processing based on the perceptron algorithm. We show how the algorithms can be efficiently applied to exponential sized representations of parse trees, such as the "all subtrees" (DOP) representation described by (Bod 1998), or a representation tracking all sub-fragments of a tagged sentence. We give experimental results showing significant improvements on two tasks: parsing Wall Street Journal text, and named-entity extraction ...

76 The form is the substance: classification of genres in text

Nigel Dewdney, Carol VanEss-Dykema, Richard MacMillan

July 2001 **Proceedings of the workshop on Human Language Technology and Knowledge Management - Volume 2001**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(64.60 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)



Categorization of text in IR has traditionally focused on topic. As use of the Internet and e-mail increases, categorization has become a key area of research as users demand methods of prioritizing documents. This work investigates text classification by format style, i.e. "genre", and demonstrates, by complementing topic classification, that it can significantly improve retrieval of information. The paper compares use of presentation features to word features, and the combination thereof, using ...

77 Improving accuracy in word class tagging through the combination of machine learning systems

Hans van Halteren, Walter Daelemans, Jakub Zavrel

June 2001 **Computational Linguistics**, Volume 27 Issue 2

Publisher: MIT Press

Full text available:  [pdf\(2.37 MB\)](#)  Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)
[Publisher Site](#)

We examine how differences in language models, learned by different data-driven systems performing the same NLP task, can be exploited to yield a higher accuracy than the best individual system. We do this by means of experiments involving the task of morphosyntactic word class tagging, on the basis of three different tagged corpora. Four well-known tagger generators (hidden Markov model, memory-based, transformation rules, and maximum entropy) are trained on the same corpus data. After comparison ...

78 Presentations: Two statistical parsing models applied to the Chinese Treebank

Daniel M. Bikel, David Chiang

October 2000 **Proceedings of the second workshop on Chinese language processing: held in conjunction with the 38th Annual Meeting of the Association for Computational Linguistics - Volume 12**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(525.60 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)


This paper presents the first-ever results of applying statistical parsing models to the newly-available Chinese Treebank. We have employed two models, one extracted and adapted from BBN's SIFT System (Miller et al., 1998) and a TAG-based parsing model, adapted from (Chiang, 2000). On sentences with ≤ 40 words, the former model performs at 69% precision, 75% recall, and the latter at 77% precision and 78% recall.

79 Comparison between tagged corpora for the named entity task

Chikashi Nobata, Nigel Collier, Jun'ichi Tsujii

October 2000 **Proceedings of the workshop on Comparing corpora - Volume 9**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(700.37 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)


We present two measures for comparing corpora based on information theory statistics such as gain ratio as well as simple term-class frequency counts. We tested the predictions made by these measures about corpus difficulty in two domains --- news and molecular biology --- using the result of two well-used paradigms for NE, decision trees and HMMs and found that gain ratio was the more reliable predictor.

80 Regular papers: Applying system combination to base noun phrase identification

Erik F. Tjong Kim Sang, Walter Daelemans, Hervé Déjean, Rob Koeling, Yuval Krymolowski, Vasin Punyakanok, Dan Roth

July 2000 **Proceedings of the 18th conference on Computational linguistics - Volume 2**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(678.60 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

We use seven machine learning algorithms for one task: identifying base noun phrases. The results have been processed by different system combination methods and all of these outperformed the best individual result. We have applied the seven learners with the best combinator, a majority vote of the top five systems, to a standard data set and managed to improve the best published result for this data set.

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81 The maximum entropy approach and probabilistic IR models

Warren R. Greiff, Jay M. Ponte

 July 2000 **ACM Transactions on Information Systems (TOIS)**, Volume 18 Issue 3

Publisher: ACM Press

Full text available: pdf(246.45 KB)

 Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

This paper takes a fresh look at modeling approaches to information retrieval that have been the basis of much of the probabilistically motivated IR research over the last 20 years. We shall adopt a subjectivist Bayesian view of probabilities and argue that classical work on probabilistic retrieval is best understood from this perspective. The main focus of the paper will be the ranking formulas corresponding to the Binary Independence Model (BIM), presented originally by Roberston and Spar ...

Keywords: idf weighting, binary independence model, combination match, linked dependence, probability ranking principle

82 Web mining research: a survey

Raymond Kosala, Hendrik Blockeel

 June 2000 **ACM SIGKDD Explorations Newsletter**, Volume 2 Issue 1

Publisher: ACM Press

Full text available: pdf(1.58 MB)

 Additional Information: [full citation](#), [citations](#), [index terms](#)

Keywords: Web, data mining, information extraction, information retrieval

83 Assigning function tags to parsed text

Don Blaheta, Eugene Charniak

 April 2000 **Proceedings of the first conference on North American chapter of the Association for Computational Linguistics**

Publisher: Morgan Kaufmann Publishers Inc.

Full text available: pdf(602.13 KB)

 Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

It is generally recognized that the common nonterminal labels for syntactic constituents (NP, VP, etc.) do not exhaust the syntactic and semantic information one would like about

parts of a syntactic tree. For example, the Penn Tree-bank gives each constituent zero or more 'function tags' indicating semantic roles and other related information not easily encapsulated in the simple constituent labels. We present a statistical algorithm for assigning these function tags that, on text already parse ...

84 Information extraction: Information extraction research and applications: current progress and future directions

Andrew Kehler, Jerry R. Hobbs, Douglas Appelt, John Bear, Matthew Caywood, David Israel, Megumi Kameyama, David Martin, Claire Monteleoni

October 1998 **Proceedings of a workshop on held at Baltimore, Maryland: October 13-15, 1998**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(1.24 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

Analysts face a daunting task: they must accurately analyze, categorize, and assimilate a large body of information from a variety of sources and for a variety of domains of interest. The complexity of the task necessitates a variety of information access and extraction tools which technology up to this point has not been able to provide. SRI's TIPSTER Phase III project has focused on two major obstacles to the development of such tools: inadequate degrees of accuracy and portability. We begin b ...

85 Feature lattices for maximum entropy modelling

Andrei Mikheev

August 1998 **Proceedings of the 17th international conference on Computational linguistics - Volume 2 , Proceedings of the 36th annual meeting on Association for Computational Linguistics - Volume 2**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(664.80 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Maximum entropy framework proved to be expressive and powerful for the statistical language modelling, but it suffers from the computational expensiveness of the model building. The iterative scaling algorithm that is used for the parameter estimation is computationally expensive while the feature selection process might require to estimate parameters for many candidate features many times. In this paper we present a novel approach for building maximum entropy models. Our approach uses the featu ...

86 Memory-based learning: using similarity for smoothing

Jakub Zavrel, Walter Daelemans

July 1997 **Proceedings of the eighth conference on European chapter of the Association for Computational Linguistics , Proceedings of the 35th annual meeting on Association for Computational Linguistics**

Publisher: Association for Computational Linguistics

Full text available:  [pdf\(764.37 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)



[Publisher Site](#)

This paper analyses the relation between the use of similarity in Memory-Based Learning and the notion of backed-off smoothing in statistical language modeling. We show that the two approaches are closely related, and we argue that feature weighting methods in the Memory-Based paradigm can offer the advantage of automatically specifying a suitable domain-specific hierarchy between most specific and most general conditioning information without the need for a large number of parameters. We report ...

87 Independence assumptions considered harmful

Alexander Franz

July 1997 **Proceedings of the eighth conference on European chapter of the Association for Computational Linguistics , Proceedings of the 35th annual**

meeting on Association for Computational Linguistics**Publisher:** Association for Computational LinguisticsFull text available:  [pdf\(695.22 KB\)](#)[Publisher Site](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Many current approaches to statistical language modeling rely on independence assumptions between the different explanatory variables. This results in models which are computationally simple, but which only model the main effects of the explanatory variables on the response variable. This paper presents an argument in favor of a statistical approach that also models the interactions between the explanatory variables. The argument rests on empirical evidence from two series of experiments concern ...

88 A new statistical parser based on bigram lexical dependencies

Michael John Collins

June 1996 **Proceedings of the 34th annual meeting on Association for Computational Linguistics****Publisher:** Association for Computational LinguisticsFull text available:  [pdf\(737.31 KB\)](#)[Publisher Site](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

This paper describes a new statistical parser which is based on probabilities of dependencies between head-words in the parse tree. Standard bigram probability estimation techniques are extended to calculate probabilities of dependencies between pairs of words. Tests using Wall Street Journal data show that the method performs at least as well as SPATTER (Magerman 95; Jelinek et al. 94), which has the best published results for a statistical parser on this task. The simplicity of the approach me ...

89 A maximum entropy approach to natural language processing

Adam L. Berger, Vincent J. Della Pietra, Stephen A. Della Pietra

March 1996 **Computational Linguistics**, Volume 22 Issue 1**Publisher:** MIT PressFull text available:  [pdf\(1.87 MB\)](#)[Publisher Site](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

The concept of maximum entropy can be traced back along multiple threads to Biblical times. Only recently, however, have computers become powerful enough to permit the widescale application of this concept to real world problems in statistical estimation and pattern recognition. In this paper, we describe a method for statistical modeling based on maximum entropy. We present a maximum-likelihood approach for automatically constructing maximum entropy models and describe how to implement this app ...

90 Parallel text search methods

Gerard Salton, Chris Buckley

February 1988 **Communications of the ACM**, Volume 31 Issue 2**Publisher:** ACM PressFull text available:  [pdf\(1.53 MB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

A comparison of recently proposed parallel text search methods to alternative available search strategies that use serial processing machines suggests parallel methods do not provide large-scale gains in either retrieval effectiveness or efficiency.

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- Enter your search terms in lower case with a space between the terms.

sales offices

You can also enter a full question or concept in plain language.

Where are the sales offices?

- Capitalize proper nouns to search for specific people, places, or products.

John Colter, Netscape Navigator

- Enclose a phrase in double quotes to search for that exact phrase.

"museum of natural history" "museum of modern art"

- Narrow your searches by using a **+** if a search term must appear on a page.

museum +art

- Exclude pages by using a **-** if a search term must not appear on a page.

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Combine these techniques to create a specific search query. The better your description of the information you want, the more relevant your results will be.

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IET JNL IET Journal or Magazine

IEEE CNF IEEE Conference Proceeding

IET CNF IET Conference Proceeding

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